CLAIMS

What is claimed is:

1. A three-dimensional flexible fibrous network comprising a flexible textile substrate having a multiplicity of compressible projections which return to their shape after being substantially compressed, wherein the substrate is selected from the group consisting of nonwovens, wovens, knits and braids manufactured from filaments and/or fibers with a diameter of less than 100 microns or at least one principal cross-sectional dimension of less than 100 microns.

2. The fiber network recited in claim 1 wherein the substrate is a single layer or multilayer composite.

3. The fiber network recited in claim 1 wherein the substrate is wholly or partially made up of a thermoplastic fiber or polymer with melting temperature in the range of 70 C to 450 C.

4. The fiber network recited in claim 3 wherein the thermoplastic polymer is a co-polyetherester elastomer with long chain ether-ester units and short chain ester units joined head to tail through ester linkages.

5. The fiber network recited in claim 3 wherein the thermoplastic polymer is a poly(ethylene terephthalate) or poly(trimethylene terephthlate).

6. The fiber network recited in claim 3 wherein the thermoplastic polymer is selected from nylon 6, nylon 6,6, polypropylene or polyethylene.

7. The fiber network recited in claim 3 wherein the thermoplastic fiber is homo-component, bicomponent, or multi-component.

8. The fiber network recited in claim 3 wherein the thermoplastic fiber used in the substrate is selected from the group consisting of: polyesters, polyamides, thermoplastic copolyetherester elastomers, polyolefines, polyacrylates, and thermoplastic liquid crystalline polymers.

9. The fiber networks recited in claim 1 wherein the substrate may further comprise tufted, stitchbonded and flocked substrates.

10. The fiber network recited in claim 1 wherein the fibrous network has projections or depressions measuring 0.1 mm to 5 cm in height.

11. The fiber network recited in claim 1 wherein the fibrous network comprises projections or depressions measuring between 0.1 mm and 100 mm in width.

12. The fiber network recited in claim 1 wherein the projections have a frusto-conical shape.

13. The fiber network recited in claim 1 wherein the fibrous network most suitably comprises filaments and/or fibers with diameters of about 1-20 microns for soft structures and 20-100 microns for rigid structures.

14. The fiber network recited in claim 1 wherein the fibrous network comprises partially oriented fibers and/or filaments.

15. The fiber network recited in claim 1 wherein the fibrous network also contains a thermoset resin.

16. The fiber network recited in claim 1 wherein the fibrous network is stiffened by nesting head-to-head or head-to-tail two or more layers of said network.

17. The fiber network recited in claim 1 wherein the fibrous network can be stiffened by laminating a planar nonwoven, woven or knitted or other planar structure such as a film or a polymeric or metallic sheet to the network.

18. The fiber network recited in claim 1 wherein the fiber comprises a tipped trilobal cross-section wherein one component melts at a lower temperature.

19. The fiber network recited in claim 1 wherein the fiber comprises a sheath/core cross-section wherein the sheath melts at a lower temperature than the core.

20. The fiber network recited in claim 1 wherein the fiber comprises a side-by-side cross-section wherein one sheath melts at a lower temperature than the other.

21. The fiber network recited in claim 1 wherein the fiber is formed into a nonwoven web by carding, airlay, wetlay, spunbond or meltblown or any combinations thereof, or by knitting, weaving and braiding or any combination thereof.

22. The fiber network recited in claim 1 wherein the nonwoven has an Anisotropy Ratio between - ½ to ½.

23. A method to form the fiber network recited in claim 1, including forming the fiber network by thermo-forming, stamping, calendaring, deep-draw molding, pressing, or a combination thereof.

24. The method recited in claim 23 including adding additional function-ability to the fiber network by including barrier layers, additional fibrous and non-fibrous layers, thermosetting resins, functional finishes such as waterproofing, mildew resistance, and/or permeability modification.

25. A three-dimensional flexible fibrous network comprising a molded flexible textile substrate having a multiplicity of compressible projections which return to their shape after being substantially compressed, wherein the substrate is selected from the group consisting of wovens, knits and braids manufactured from filaments and/or fibers with a diameter of less than 100 microns or at least one principal cross-sectional dimension of less than 100 microns and nonwovens manufactured from filaments and/or fibers with a diameter of greater than 100 microns where the fiber-to-fiber crossover intersections are partially or fully fused during the molding process to provide substantial rigidity to the flexible textile substrate.

26. The fiber network recited in claim 25 wherein the substrate is a single layer or multilayer composite.

27. The fiber network recited in claim 25 wherein the substrate is wholly or partially made up of a thermoplastic fiber or polymer with melting temperature in the range of 70 C to 450 C.

28. The fiber network recited in claim 27 wherein the thermoplastic polymer is a co-polyetherester elastomer with long chain ether-ester units and short chain ester units joined head to tail through ester linkages.

29. The fiber network recited in claim 27 wherein the thermoplastic polymer is a poly(ethylene terephthalate) or poly(trimethylene terephthlate).

30. The fiber network recited in claim 27 wherein the thermoplastic polymer is selected from nylon 6, nylon 6,6, polypropylene or polyethylene.

31. The fiber network recited in claim 27 wherein the thermoplastic fiber is homo-component, bicomponent, or multi-component.

32. The fiber network recited in claim 27 wherein the thermoplastic fiber used in the substrate is selected from the group consisting of: polyesters, polyamides, thermoplastic copolyetherester elastomers, polyoefines, polyacrylates, and thermoplastic liquid crystalline polymers.

33. The fiber network recited in claim 25 wherein the substrate may further comprise tufted, stitchbonded and flocked substrates.

34. The fiber network recited in claim 25 wherein the fibrous network has projections or depressions measuring 0.1 mm to 5 cm in height.

35. The fiber network recited in claim 25 wherein the fibrous network comprises projections or depressions measuring between 0.1 mm and 100 mm in width.

36. The fiber network recited in claim 25 wherein the projections have a frusto-conical shape.

37. The fiber network recited in claim 25 wherein the fibrous network comprises partially oriented fibers and/or filaments.

38. The fiber network recited in claim 25 wherein the fibrous network also contains a thermoset resin.

39. The fiber network recited in claim 25 wherein the fibrous network is stiffened by nesting head-to-head or head-to-tail two or more layers of said network.

40. The fiber network recited in claim 25 wherein the fibrous network can be stiffened by laminating a planar nonwoven, woven or knitted or other planar structure such as a film or a polymeric or metallic sheet to the network.

41. The fiber network recited in claim 25 wherein the fiber comprises a tipped trilobal cross-section wherein one component melts at a lower temperature.

42. The fiber network recited in claim 25 wherein the fiber comprises a sheath/core cross-section wherein the sheath melts at a lower temperature than the core.

43. The fiber network recited in claim 25 wherein the fiber comprises a side-by-side cross-section wherein one side melts at a lower temperature than the other.

44. The fiber network recited in claim 25 wherein the fiber is formed into a nonwoven web by carding, airlay, wetlay, spunbond or meltblown or any combinations thereof, or by knitting, weaving and braiding or any combination thereof.

45. The fiber network recited in claim 25 wherein the nonwoven has an Anisotropy Ratio between -½ to ½.

46. A method to form the fiber network recited in claim 25, including forming the fiber network by thermo-forming, stamping, calendaring, deep-draw molding, pressing, or a combination thereof.

47. The method recited in claim 46 including adding additional function-ability to the fiber network by including barrier layers, additional fibrous and non-fibrous layers, thermosetting resins, functional finishes such as waterproofing, mildew resistance, and/or permeability modification.